REMARKS

In response to the Examiner's Action mailed on July 3, 2002, the drawings and claims 15 to 42 are amended. The applicants hereby respectfully request that the patent application be reconsidered.

An item-by-item response to Examiner's objections or rejections is provided in the followings:

I Objection to Specification

The Examiner objects to the specification because of the following informalities: Protective layer 108 (Page 1, line 22) should read protective layer 110. And line 28 should read "on to printed... ". Appropriate correction is required.

In response to the objection, the first paragraph of the "Description of the Prior Art" is amended and the informalities are corrected.

II. Rejection of Claims Under 35 USC § 102

The Examiner rejects claims 15-17 under 35 USC § 102(b) as being anticipated by Robbins (US 4,788,523).

According to the Examiner, Robbins discloses in fig. 7 a resistor array supported on a metal plate composed of a low temperature coefficient of resistance (TCR) metallic material, said resistor array comprising a plurality of electrode columns 222 composed of low TCR metallic material disposed on said metal plate. As to claim 16, Robbins discloses at least an electrode layer disposed on each of said electrode columns to form an electrode for each of said electrode columns. As to

claim 17, Robbins discloses a plurality of scribing lines for scribing said metal plate into a plurality of resistors each comprising at least two electrodes.

In response to the rejection, claims 15-17 are amended. Specifically, the amended claim 15 is directed to a resistor array that includes:

a) a plurality of resistors each comprising **a metallic bulk base**;

b) a plurality of electrodes composed of conductive material disposed **directly on said metallic bulk base** wherein **said metallic bulk base between every two of said electrodes having a precisely controlled distance for providing a precisely defined resistance for each of said resistors**.

In contrast to the Robbins' "viad chip resistor made from an insulative wafer" (Abstract of Robbins), Robbins does not disclose a resistor array that includes resistors each comprising a metallic bulk base having electrodes disposed directly on the metallic bulk base. Instead, Robbins discloses an array of viad film chip resistors (column1 , lines 54-55) that form conductive pads on insulative substrate applying thick film technology(column 2 lines 38-39). The resistor array as directed by the amended claim 15 and all the dependent claims, including claims 16 and 17, are formed on a metallic bulk base and does not have conductive pads or films, and therefore totally different and not anticipated by Robbins.

The Examiner further rejects claims 30 and 31 under 35 U.S.C. 102(b) as being anticipated by Robbins US No. 4,788,523. According to the Examiner, Robbins discloses in figs. 1-7 a resistor supported on a metal plate composed of a low temperature coefficient of resistance (TCR) metallic material, said resistor comprising at least two of electrode columns 222 composed of low TCR metallic material disposed on said metal plate. As to claim 31, Robbins discloses at least an electrode layer

disposed on each of said electrode columns to form an electrode for each of said electrode columns.

In response to the rejection, claims 30 and 31 are also amended. The amended claim 30 is directed to a resistor that includes:

a) **a metallic bulk base**;

b) at least **two electrodes composed of a conductive material disposed directly on said metallic bulk base** and having precisely controlled distance between said two electrodes for providing a precisely defined resistance for said resistor.

Again, as discussed above, the resistor now directed by the resistor as directed by the amended claim 30 and all the dependent claims including claims 31, is different from Robbins. The structure and method of manufacture are totally different. Therefore, the invention as now amended would be novel, non-obvious and patentable over Robins.

III. Rejection of Claims Under 35 USC § 103

The Examiner rejects claims 18 and 32 under 35 USC § 103(a) as being unpatentable over Robbins in view of Thomas et al. (3. Vac. Sci. Technol., Vol. 13, No. 1, Jan/Feb. 1976).

According to the Examiner, Robbins discloses al the claimed subject matter but does not specifically disclose a nickel-copper alloy metallic material. Thomas et al. disclose in fig. 2 a low TCR metallic material composed of a metal plate comprising a nickel-copper alloy. Therefore, it would have been obvious to one skilled in the art at the time the invention was made to use a nickel-copper alloy metallic material, since having a metallic material comprising same material as a resistor/electrode would save material thereby reducing cost.

As discussed above, claims 15 and 30 are amended to include a metallic bulk base and electrodes disposed directly on the metallic bulk base. The amended claims 15 and 30 are different in structure and method of manufacture. Both Thomas and Robbins have resistive films to function as the resistive elements. In contrast, the amended claims of this invention now director to resistor and resistor array using the metallic bulk base as the resistor body without the structure or manufacturing processes to form films or pads on ceramic or dielectric substrates. Therefore, the amended claims 15 and 30 and all the dependent claims including claims 18 and 32 are new and not obvious over the combinations of the cited prior art references.

The Examiner further rejects claims 20 and 34 under 35 U.S.C. 103(a) as being unpatentable over Robbins in view of Sone et al. (JP 2000-173801). According to the Examiner, Robbins fails to specifically disclose resistors having resistance ranging between one milli-ohm to ohm. Sone et al disclose in figs. 1-10 plurality of electrode columns disposed on a metal plate having a precisely defined position for providing precisely defined resistance for each resistors. Therefore, it would have been obvious to one ordinary skill in the art at the time the invention was made to dispose metal plate having a precisely defined position for providing precisely defined resistance for each resistors, since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or working ranges involves only routine skill in the art. In re Aller, 105 USPQ 233. As to claims 21, 22, 35 and 38, Sone et al disclose low resistance resistors could be achieved by adjusting dimensions of certain elements of the device. Robins discloses a length of a resistor of about 2.54 mm. Therefore, it would have been obvious to one ordinary skill in the art at the time the invention was made to use electrodes and resistors of a suitable dimensions, since it has been held that where the general conditions of a claim are disclosed in the prior art,

discovering the optimum or working ranges involves only routine skill in the art. In re Aller, 105 USPQ 233.

The Examiner further rejects claims 19 and 33 under 35 U.S.C. 103(a) as being unpatentable over Robbins in view of Shimada (JR 8-22903). According to the Examiner, Robbins fails to specifically disclose an electrode layer disposed on each of said electrode columns comprising a copper layer and a tin-lead alloy layer on each of said electrode column. Shimada discloses an electrode layer disposed on each of electrode columns 2 comprising a copper layer 7 and a tin-lead alloy layer 9 on each of said electrode columns. Therefore, it would have been obvious to one skilled in the art at the time the invention was made to employ a copper layer and a tin-lead alloy layer on each of said electrode columns, since that would control solder wetting degradation and improves background surface of nickel plating.

The Examiner further rejects claims 23-25 under 35 U.S.C. 103(a) as being unpatentable over Robbins in view of Thomas et al. (J.Vac. Sci. Technol., Vol. 13, No.1, Jan/Feb. 1976). According to the Examiner, Robbins discloses in fig. 7 a resistor array supported on a metal plate composed of a low temperature coefficient of resistance (TCR) metallic material, said resistor array comprising a plurality of electrode columns 222 composed of low TCR metallic material disposed on said metal plate. Thomas et al disclose electroplated electrodes composed of low TCR metallic material. Therefore, it would have been obvious to one skilled in the art at the time the invention was made to use electroplated electrodes, since that would provide the capability of reducing a conductor resistance. As to claim 24, Robbins discloses a plurality of scribing lines for scribing said metal plate into a plurality of resistors each comprising at least two electrodes. As to claim 25, Thomas et al. disclose in fig. 2 a low TCR metallic material composed of a metal plate comprising a nickel-copper

alloy.

The Examiner further rejects claims 37 and 38 under 35 U.S.C. 103(a) as being unpatentable over Robbins in view of Thomas et al. (J. Vac. Sci. Technol., Vol. 13, No.1 Jan/Feb. 1976). According to the Examiner, Robbins discloses in fig. 7 a resistor supported on a metal plate composed of a low temperature coefficient of resistance (TCR) metallic material, said resistor comprising at least tow electrode columns 222 composed of low TCR metallic material disposed on said metal plate. Thomas et al disclose electroplated electrodes composed of low TCR metallic material. Therefore, it would have been obvious to one skilled in the art at the time the invention was made to use electroplated electrodes, since that would provide the capability of reducing a conductor resistance. As to claim 38, Thomas et al. disclose in fig. 2 a low TCR metallic material composed of a metal plate comprising a nickel-copper alloy.

The Examiner further rejects claims 27 and 40 under 35 U.S.C. 103(a) as being unpatentable over Robbins in view of Thomas et al as applied to claims 23 and 37 above, and further in view of Sone et al. (JP 2000-173801). According to the Examiner, the combined references fail to specifically disclose resistors having resistance ranging between one milli-ohm to ohm. Sone et al disclose in figs. 1-10 plurality of electrode columns disposed on a metal plate having a precisely defined position for providing precisely defined resistance for each resistors. Therefore, it would have been obvious to one ordinary skill in the art at the time the invention was made to dispose metal plate having a precisely defined position for providing precisely defined resistance for each resistors, since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or working ranges involves only routine skill in the art. In re Aller, 105 USPQ 233. As to claims 28, 29, 41 and 42, Sone et al disclose low resistance resistors could be achieved by

adjusting dimensions of certain elements of the device. Robins discloses a length of a resistor of about 2.54 mm. Therefore, it would have been obvious to one ordinary skill in the art at the time the invention was made to use electrodes and resistors of a suitable dimensions, since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or working ranges involves only routine skill in the art. In re Aller, 105 USPQ 233.

The Examiner further rejects claims 28 and 39 under 35 U.S.C. 103(a) as being as being unpatentable over Robbins in view of Thomas et al as applied to claims 23 and 37 above, and further in view of Shimada (JP 8-22903). According to the Examiner the combined references fail to specifically disclose column-shaped electroplated electrode comprising a copper layer and a tin-lead alloy layer. Shimada discloses electroplated electrode comprising a copper layer 7 and a tin-lead alloy layer 9. Therefore, it would have been obvious to one skilled in the art at the time the invention was made to employ a copper layer and a tin-lead alloy layer, since that would control solder wetting degradation and improves background surface of nickel plating.

In response to Examiner's rejections, claims 15 to 42 are amended. As discussed above, the amended claims are directed to resistor array or resistor implemented with a metallic bulk base for function as the resistive element. The electrodes are disposed directly on the metallic bulk base. As fully explained in the Patent Application, precisely controlled dimension of the metallic bulk base and the distance between the electrode provide precisely controlled resistance. Laser trimming and refined dimension adjustments are not required by applying the manufacturing process to produce a totally new and not obvious structure for the resistor array and resistor as now directed by the amended claims. All the cited prior art references are based on "resistive film" or "multi-

layer" resistor structure. In contrast to this invention as now specifically directed by the amended claims, the structure and the methods of manufacture are different. For these reasons, the amended claims would be new and not obvious over the combinations of all the cited prior art references.

For these reasons, the Applicants would respectfully request that the rejections of these claims based on the cited prior art be withdrawn.

With the amended drawings, the canceled and amended claims, and the reasons provided above, applicants hereby respectfully request that Examiner's rejections under 37 CFR § 1.83(p)(4), and 35 USC § 112, 102 and 103 be withdrawn and the present application be allowed.

Respectfully submitted,
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By _____

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In the claims:

(Amended) 15. A resistor array [supported on a metal plate composed of a low temperature coefficient of resistance (TCR) metallic material, said resistor array] comprising:

a plurality of resistors each comprising a metallic bulk base;

a plurality of electrodes [electrode columns] composed of [said low TCR metallic] conductive material disposed directly on said metallic bulk base wherein said metallic bulk base between every two of said electrodes having a precisely controlled distance for providing a precisely defined resistance for each of said resistors. [metal plate].

(Amended) 16. The resistor array of claim 15 further comprising:

at least an electrode layer of said conductive material disposed on each of said electrodes [electrode columns] to form an electrode for each of said electrodes [electrode columns] .

(Amended) 17. The resistor array of claim 15 further comprising:

a plurality of scribing lines disposed between said resistors for scribing said [metal plate] resistor array into a plurality of resistors each comprising at least two electrodes.

(Amended) 18. The resistor array of claim 15 wherein:

said metallic bulk base of said resistors composed of a nickel-copper alloy [low TCR metallic material composed of said metal plate further comprises a nickel-copper alloy].

(Amended) 19. The resistor array of claim 15 wherein:

[said electrode layer disposed on] each of said electrodes [electrode columns] further comprises a copper layer and a tin-lead alloy layer disposed on each of said electrodes [electrode columns].

(Amended) 20. The resistor array of claim 15 wherein:

said [plurality electrode columns disposed on said metal plate having a precisely defined position for providing] precisely defined resistance for each of said resistors ranging between one milli-ohm to one ohm.

(Amended) 21. The resistor array of claim 15 wherein:

said metallic bulk base of each of said plurality of resistors having a thickness ranging between 0.05 to 0.5 millimeters and a length ranging between 1.0 to 7.0 millimeters.

(Amended) 22. The resistor array of claim 15 wherein:

each of said plurality of electrodes [electrode columns] disposed directly on said metallic bulk base [metal plate] having a width and length ranging between 0.1 to 3.2 millimeter, a height ranging between 0.05 to 0.5 millimeters and distance ranging between 0.4 to 6.2 millimeters between every two electrodes [electrode columns].

(Amended) 23. A resistor array [supported on a metal plate composed of a low temperature coefficient of resistance (TCR) metallic material, said resistor array] comprising:

a plurality of resistors each comprising a metallic bulk base;

a plurality of column-shaped electroplated electrodes disposed directly on said metallic bulk base and having precisely controlled distance between every two of said electrodes for providing a precisely defined resistance for each of said resistors [metal plate composed of said low TCR metallic material].

(Amended) 24. The resistor array of claim 23 further comprising:

a plurality of scribing lines disposed between said resistors for scribing said [metal plate] resistor array into a plurality of resistors each comprising at least two electrodes.

(Amended) 25. The resistor array of claim 23 wherein:

said metallic bulk base of said resistors composed of a nickel-copper alloy [low TCR metallic material composed of said metal plate further comprises a nickel-copper alloy].

(Amended) 26. The resistor array of claim 23 wherein:

said plurality of column-shaped electroplated electrodes disposed directly on said metallic bulk base further comprises a copper layer and a tin-lead alloy layer.

(Amended) 27. The resistor array of claim 23 wherein:

said [plurality of electrode columns disposed on said metal plate having a precisely defined position for providing] precisely defined resistance for each of said resistors ranging between one milli-ohm to one ohm.

(Amended) 28. The resistor array of claim 23 wherein:

said metallic bulk base of each of said plurality of resistors having a thickness ranging between 0.05 to 0.5 millimeters and a length ranging between 1.0 to 7.0 millimeters.

(Amended) 29. The resistor array of claim 23 wherein:

each of said plurality of column-shaped electrodes disposed directly on said metallic bulk base having a width and length ranging between 0.1 to 3.2 millimeter, a height ranging between 0.05 to 0.5 millimeters and distance ranging between 0.4 to 6.2 millimeters between every two electrodes.

(Amended) 30. A resistor [supported on a metal plate composed of a low temperature coefficient of resistance (TCR) metallic material, said resistor]comprising:

a metallic bulk base;

at least two electrodes [electrode columns] composed of a conductive [said low TCR metallic] material disposed directly on said metallic bulk base [metal plate] and having precisely controlled distance between said two electrodes for providing a precisely defined resistance for said resistor.

(Amended) 31. The resistor of claim 26 further comprising:

at least an electrode layer of said conductive material disposed on each of said electrodes [electrode columns] to form an electrode for each of said electrode columns.

(Amended) 32. The resistor of claim 30 wherein:

said <u>metallic bulk base composed of a nickel-copper alloy</u> [low TCR metallic material composed of said metal plate further comprises a nickel-copper alloy].

(Amended) 33. The resistor of claim 30 wherein:

[said electrode layer disposed on each of] said <u>electrodes</u> [electrode columns] further comprises a copper layer and a tin-lead alloy layer <u>disposed</u> on each of said electrode columns.

(Amended) 34. The resistor of claim 30 wherein:

said [electrode columns disposed on said metal plate having a precisely defined position for providing] precisely defined resistance for said resistor ranging between one milli-ohm to one ohm.

(Amended) 35. The resistor of claim 30 wherein:

<u>said metallic bulk base of</u> said resistor having a thickness ranging between 0.05 to 0.5 millimeters and a length ranging between 1.0 to 7.0 millimeters.

(Amended) 36. The resistor of claim 30 wherein:

each of said electrodes [electrode columns] disposed directly on said metallic bulk base [metal plate] having a width and length ranging between 0.1 to 3.2 millimeter, a height ranging between 0.05 to 0.5 millimeters and distance ranging between 0.4 to 6.2 millimeters between every two electrodes [electrode columns].

(Amended) 37. A resistor [supported on a metal plate composed of a low temperature coefficient of resistance (TCR) metallic material, said resistor] comprising:

a plurality of resistors each comprising a metallic bulk base;

a least two column-shaped electroplated electrodes disposed directly on said metallic bulk base and having precisely controlled distance between said electrode columns for providing a precisely defined resistance for said resistor [metal plate composed of said low TCR metallic material].

(Amended) 38. The resistor of claim 37 wherein:

said metallic bulk base of said resistor composed of a nickel-copper alloy [low TCR metallic material composed of said metal plate further comprises a nickel-copper alloy].

(Amended) 39. The resistor of claim 37 wherein:

said column-shaped electroplated electrodes disposed directly on said metallic bulk base further comprises a copper layer and a tin-lead alloy layer.

(Amended) 40. The resistor of claim 37 wherein:

said [column-shaped electroplated electrodes disposed on said metal plate having a precisely defined position for providing] precisely defined resistance for said resistor ranging between one milli-ohm to one ohm.

(Amended) 41. The resistor of claim 37 wherein:

said metallic bulk base of said resistor having a thickness ranging between 0.05 to 0.5 millimeters and a length ranging between 1.0 to 7.0 millimeters.

(Amended) 42. The resistor of claim 37 wherein:

each of said column-shaped electrodes disposed directly on said metallic bulk base having a width and length ranging between 0.1 to 3.2 millimeter, a height ranging between 0.05 to 0.5 millimeters and distance ranging between 0.4 to 6.2 millimeters between every two electrodes.

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VERSION WITH MARKINGS TO SHOW CHANGES MADE

In the Specfication:

On Page 1, pleas amend the first Paragraph in " The description of the Prior Art" as set forth below:

For those of ordinary skill in the art, the process of manufacturing a resistor with precisely controlled low resistance becomes a challenge for several reasons. As that shown in Fig. 1, a conventional resistor 100 is supported on a ceramic substrate 102 that includes a input electrode 104 and an output electrode 106 formed on two opposite ends on the ceramic substrate 102. A layer of thin resistive film 108 is formed on the top surface 112 of the ceramic substrate 102 between two electrodes 104 and 106 and a preservation protective layer [108} 110 is formed on top of the resistive film 108. The resistor 100 with such a configuration can be mounted onto a printed circuit board with a surface mount technology (SMT) for establishing connection through the electrodes to the external circuits. Alternatively, the top surface 114 of the input electrode 104 and the top surface 116 of the output electrode 106 can be soldered to circuits on [t] to printed circuit board by applying a reflow process.

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